

tion of Lummer's "Photographic Optics." A separate chapter deals with the reflexion and refraction of astigmatic bundles of rays, and in a further chapter the colour aberrations are discussed.

The last chapter, which is of considerable importance, reproduces Abbe's theory of the action of the "stops" in an optical instrument, and deals generally with questions depending on the aperture and the field of view.

The preceding notes will sufficiently indicate the scope of the book. It is confined to the discussion of general optical principles, and methods of calculation applicable to optical instruments, and does not actually deal with the application of these methods. It thus covers practically the same ground as vol. i. of "Die Theorie der optischen Instrumente" already referred to. The subtitle of that volume, "Image formation in optical instruments from the standpoint of geometrical optics," is, indeed, excellently descriptive of the present work. The range is sufficiently extensive, and it would hardly be possible, within the limits of a single volume, to include in addition the theory of lens design, or the application of the general principles to special types of optical instruments. On the other hand, a volume, or rather volumes, dealing with these applications are urgently needed. It is to be feared that there are many practical opticians in this country to whom it may appear that this work offers little of immediate practical importance, and to whom it would only be possible to work back, so to speak, to the present volume from one dealing with its immediate application to, say, the telescope or the photographic lens. It is earnestly to be hoped that Prof. Southall may be persuaded to provide them with the opportunity. There are few who have his equipment for the task, and the need is universally recognised. There can be no question that by the issue of the present volume Prof. Southall has rendered a great service to American and to English opticians.

It may be added that the general get-up of the book is excellent; the type is clear, and the figures well drawn. Some of the figures, however, would have been much improved if they had been reproduced on a somewhat larger scale.

#### MANCHURIA, KOREA, AND RUSSIAN TURKESTAN.

*The Face of Manchuria, Korea, and Russian Turkestan.* Written and illustrated by E. G. Kemp. Pp. xv+248+xxiv plates. (London: Chatto and Windus, 1910.) Price 7s. 6d. net.

THE facilities afforded by extended railway communication to remote regions of eastern Asia have rendered it possible for the leisured tourist to travel safely, and with comparative comfort, from Russia to the seaboard of Asia on the east in a direct line traversing a vast area, a great part of which still remains unexplored, especially in Korea and Russian Turkestan, although excellent work has been done within the last decade by intrepid travellers in crossing the deserts, and surveying the mountain chains in which this part of Asia abounds. Judging from

previous work, the author, as an expert tourist, has had some useful training, and has not wholly confined descriptions of the route to the face of things, but has invested the work with unusual interest by historical and other notes concerning the races inhabiting the countries traversed. Four months covered the outward and return journeys, following the lines of the Transsiberian Railway, and onward by connecting lines to Korea, and home again.

The result is the volume under review, which forms an attractive addition to tourist literature, a picturesque guide-book so agreeably written as to captivate the reader who has neither time nor opportunity to follow in the author's footsteps. The historical notes are discriminating and sufficient for the purpose, while the accounts of various regions and races inhabiting them, their religion, social condition, &c., are not without interest. The political outlook created by the new alliance of Russia and Japan is painted in sombre colours. The Japanese determined by force, if necessary, to coerce the Chinese into throwing Manchuria open to Japanese colonisation, and the attitude of China to resist advances. On the other hand, there is Russia's demand to construct and control a railway direct from Irkutsk to Peking, and to prevent the Chinese running a line into Mongolia.

The position created for China is therefore not without the gravest peril, and in the future may lead to serious complications in view of China's progress as a military Power. The author acknowledges indebtedness for trustworthy information supplied along the route. The line into Manchuria joins the Transsiberian Railway with the continuation of the line to Mukden and Peking, enabling the traveller to reach the Chinese capital, starting from London, in about seventeen days. The Japanese appear to have been forestalled in their desire to colonise Manchuria, as the country is being rapidly overrun by Chinese immigrants, owing to its great fertility, and affording an excellent home to the settlers, who are more prosperous than elsewhere in the empire.

The first section of railway to Kharbin is under Russian control, having soldiers posted at intervals all along the line. Half-way from Kharbin to Mukden it becomes Japanese, having military officers on board the trains. The author's brief historical note on Manchu history may be rendered all the more interesting by a perusal of Mr. Meadows's "History of the Manchus." It goes back to the eleventh century B.C., and is full of adventure, enterprise, and war up to 1644, when the Manchus conquered and founded the present dynasty as rulers of China, when they settled down, adopting Chinese methods of government.

Mukden, the Manchu capital, a picturesque and famous old city, is visited and described. It has fallen into decay, although not without signs of renewed life by the transforming influence of the West. The old palace museum contains perhaps the finest collection of ancient Chinese bronzes and porcelain that exists. Some account is given of the Boxer rising and ravages. The hospital of the missions was wrecked, but has been rebuilt, and we are pleased to note that the Viceroy has promised to contribute 480*l.* annually in support of this beneficent institution. The

author's experiences in Korea are not the least interesting part of the book. Korea proves a most successful mission field in the East. The annual native contribution to the missions is estimated at 25,000*l*.

The quaint city of Seoul, under Japanese rule, leaves no doubt in the minds of visitors of the thoroughness of their governing methods as carried out in minute detail. One of the most serious losses sustained by the Koreans was the death of the wise Prince Ito, their governor. It was discovered when the murderer of the Prince was condemned to death that he was writing a poem, and the Japanese judge with grim humour, or Confucian regard for literature, granted him ten days' grace in order that he might finish the effusion.

We must now leave the reader to follow the author through Russian Turkestan, and in connection with this part of the route he might consult Dr. Stein's account of his recent exploration and wonderful discoveries in the Turkestan desert, and Mr. Carruthers's recent survey in the mountain region peopled by the Kurghiz. The author's attractive sketches add to the value of the book.

J. T.

#### VARIABILITY IN "LOWER" ORGANISMS.

*Die Variabilität niederer Organismen. Eine descentztheoretische Studie.* By Hans Pringsheim. Pp. viii+216. (Berlin: Julius Springer, 1910.) Price 7 marks.

THIS book is an attempt to analyse and correlate the known facts regarding variations in certain so-called "lower" organisms. Among these, the Bacteria occupy the chief place, although the Fungi—especially the Saccharomycetes—and the Protozoa are also considered to some extent.

To anyone acquainted with the present state of the literature of this subject, it is unnecessary to point out the difficulties entailed in writing a book of this sort: yet from the admirably clear and concise manner in which the author has presented the facts, the average reader will obtain but a very faint idea of the large amount of patient labour which has been devoted to the task. Perhaps no greater praise could be given to a work of this sort—a work which is unique in that it attempts to correlate the variability of unicellular organisms with that of "higher" forms, and thus to supply biological facts in place of the *a priori* notions which are usually given regarding the "lower" organisms when considered in relation to the theory of organic evolution.

As a compilation of facts, the work leaves little to be desired. The omissions are, for the most part, unimportant. With the author's analysis and interpretation of the facts, however, we by no means always agree: but it is impossible to discuss these properly in a few words, as almost every paragraph in the analytical sections contains a significant idea. By the admirable method which the author has adopted of relegating the literature references and details to a separate section—thus eliminating a large mass of facts of great, but secondary, importance from the main body of the text—a very clear and readable

statement of the facts and arguments has been achieved.

The author begins with a brief consideration of the significance and causes of variability in general, and of the heritability of variable characters. It may be noted that the term *mutation* is rejected, and the variations of "lower" organisms are designated *fluctuations*, when they arise from internal causes, and *adaptions* (*sic*) or *accommodations*, when they are called forth by external influences. After some discussion of the struggle for existence in "lower" organisms, and of the limits within which variations occur, the author passes to an enumeration of the observed facts regarding variations in these forms.

As already noted, most of the facts are derived from the Bacteria. They therefore relate chiefly to physiological variations. The author describes variations in colony formation, optimum growth temperature, motility, spore formation, metabolism, ferment and colour production, virulence, and a number of other variable characters. Morphological variations—arising naturally, from innate and unknown causes, or produced by temperature changes, poisons, &c.—are also briefly considered: but pleomorphism is dismissed in a few words, as the author regards it as a normal event in the life-cycle of those forms which display the phenomenon, and therefore properly to be eliminated from a discussion of true variations.

The author's general conclusions naturally constitute the chief feature of interest in the book. He believes "that all the observed cases of variability in micro-organisms may be interpreted as fluctuating variations" (*i.e.* arising from unknown and innate causes) "and functional adaptations": and further, that "there are heritable and non-heritable fluctuating variations in micro-organisms, just as in highly developed animals and plants."

Finally, the author considers the bearing of the facts upon Weismann's view of the relation between amphimixis and variability. From the recorded observations on the variability of "lower" organisms, he concludes that no reasonable grounds exist for supposing that amphimixis causes increased variability in the organisms possessing it, because a high degree of variability is found in non-sexual "lower" organisms which multiply by simple fission.

"One of the chief advantages of amphimictic reproduction is the exclusion of the inheritance of acquired characters and the enforced equalisation of the variable characteristics of special individuals."

A detailed criticism of this important work is not possible in the short space allotted to the present review. We would point out, however, that our chief personal criticism concerns the author's point of view—implied in the title of the book, and impressing itself upon all the author's biological ideas. We do not regard the so-called "lower" organisms as beings which are nearer the beginnings of life than the so-called "higher" forms. The Protista—even the Bacteria—display considerable morphological differentiation, and a physiological complexity which is not "low" in any sense. We believe that a much profounder analysis of fundamentals is required than that given in this book. It is also our opinion that the